10/501713
DT04 Rec'd PCT/PTO 19 JUL 2004

What is claimed is:

1. A membrane comprising a sheetlike flexible substrate having a multiplicity of openings and having a porous coating on and in said substrate, said coating comprising inorganic components, characterized by
the material of said substrate being selected from nonwovens of polymeric or natural fibers, said nonwovens having a porosity of more than 50%, said substrate being from 10 to 200 μm in thickness and said coating being a porous ceramic coating.

2. The membrane of claim 1, characterized by said polymeric fibers being selected from polyacrylonitrile, polyamides, polyimides, polyacrylates, polytetrafluoroethylene, polyester and/or polyolefin.

3. The membrane of one of claims 1 or 2, characterized by said polymeric fibers being from 1 to 25 μm in diameter.

4. The membrane of any of claims 1 to 3, characterized by the porosity of said substrate being in the range from 50 to 97%.

5. The membrane of at least one of claims 1 to 4, characterized by said coating on and in said substrate comprising an oxide of the metals Al, Zr, Si, Ti and/or Y.

6. The membrane of at least one of claims 1 to 5, characterized by a porosity in the range from 10 to 70%.

7. The membrane of at least one of claims 1 to 6, characterized by an average pore size in the range from 10 to 2000 nm.

8. The membrane of any of claims 1 to 7, characterized by a tensile strength of more than 1 N/cm.

9. The membrane of at least one of claims 1 to 8, characterized by being bendable around a radius down to 100 m without damage.

10. The membrane of at least one of claims 1 to 9, characterized by being bendable around a radius down to 2 mm without damage.

11. A process for producing a membrane as claimed in at least one of claims 1 to 10, which comprises providing a substrate from 10 to 200 μm in thickness, selected from nonwovens of polymeric or natural fibers having a porosity of more than 50%, with a coating, said coating being a porous ceramic coating which is brought onto and into said substrate by applying a suspension and heating one or more times to solidify said suspension on and in said substrate, said suspension comprising at least one oxide of the metals Al, Zr, Si, Ti and/or Y and a sol.

12. The process of claim 11, wherein said suspension is brought onto and into said substrate by printing on, pressing on, pressing in, rolling on, knifecoating on, spreadcoating on, dipping, spraying or pouring on.

13. The process of either or both of claims 11 and 12, wherein said polymeric fibers are selected from

polyacrylonitrile, polyamides, polyimides, polyacrylates, polytetrafluoroethylene, polyester and/or polyolefin.

14. The process of at least one of claims 11 to 13, wherein said suspension comprises at least one metal oxide sol, at least one semimetal oxide sol or at least one mixed metal oxide sol or a mixture thereof and is prepared by suspending at least one inorganic component in at least one of these sols.

15. The process of claim 14, wherein said sols are obtained by hydrolyzing at least one metal compound, at least one semimetal compound or at least one mixed metal compound using water or an acid or a combination thereof.

16. The process of claim 14 or 15, wherein said sol comprises less than 50% by weight of water and/or acid.

17. The process of at least one of claims 14 to 16, wherein said metal compound hydrolyzed is at least one metal alkoxide compound or at least one semimetal alkoxide compound selected from the alkoxide compounds of the elements Zr, Al, Si, Ti and Y or at least one metal nitrate, metal carbonate or metal halide selected from the metal salts of the elements Zr, Al, Si, Ti and Y.

18. The process of at least one of claims 11 to 17, wherein said inorganic component suspended is at least one oxide selected from the oxides of the elements Y, Zr, Al, Si and Ti.

19. The process of at least one of claims 11 to 18, wherein the mass fraction of said suspended

component is from 0.1 to 500 times that of the sol used.

20. The process of at least one of claims 11 to 19, further comprising adding an adhesion promoter to said suspension.

21. The process of at least one of claims 11 to 20, further comprising providing the carrier with an adhesion promoter on said fibers prior to said applying of said suspension.

22. The process of claim 20 or 21, wherein said adhesion promoter is selected from the organofunctional silanes and/or the oxides of the elements Zr, Al, Si or Ti.

23. The process of claim 22, wherein said adhesion promoter is selected from 3-aminopropyltriethoxysilane, 2-aminoethyl-3-aminopropyltrimethoxysilane, 3-glycidyloxytrimethoxysilane, 3-methacryloyloxypropyltrimethoxysilane, vinyltriethoxysilane, vinyltrimethoxysilane and vinyltris(2-methoxyethoxy)silane.

24. The process of at least one of claims 11 to 23, wherein said suspension present on and in the support is solidified by heating at from 50 to 350°C.

25. The process of claim 24, wherein said heating is effected at from 110 to 280°C for from 0.5 to 10 minutes.

26. The use of a membrane as claimed in at least one of claims 1 to 10 as a separator in batteries.

27. The use of a membrane as claimed in at least one of claims 1 to 10 as a carrier for ultrafiltration, nanofiltration, reverse osmosis, gas separation or pervaporation membranes.

28. The use of a membrane as claimed in at least one of claims 1 to 10 as a microfiltration membrane.